

Pulse-Width-Modulation Provides Fast Dynamic Performance

The LLNL pulse-width-modulated, switch-mode power supplies have rapid-response feedback loops for regulating the output voltage and current. The current source also limits the output current during a load arc, terminates the arc in microseconds, and recovers from the arc in milliseconds. Because of the circuit topologies, the relatively high switching frequencies, and the controllability and speed of the IGBTs, the typical dynamic responses for both types of power supplies are at least an order of magnitude faster than those of conventional, phase-controlled, thyristor-type power supplies.

APPLICATIONS

This technology could apply to a new generation of power supplies for:

- Resistance heaters
- Electron-beam guns
- Plasma sputtering systems
- Dc and high-frequency ac magnets
- Electro-chemical processes
- Plasma treatment of pollutants
- Electrostatic precipitators

Power supplies are compact and efficient

The high switching frequencies of the LLNL switch-mode power supplies allow small filter capacitors, inductors, and transformers to be used, which results in power supplies that are one-half to one-third the size of conventional thyristor-controlled units. The energy efficiency of the LLNL switch-mode power supplies exceeds 90% and is comparable to the efficiencies of conventional thyristor-controlled power supplies. However, the input

harmonics of the LLNL supplies are much less and the input power factor much higher (0.95)

than in thyristor-controlled power supplies. This reduces the cost of the input ac power distribution system and minimizes power supply interaction.

Joint development opportunities exist

We are interested in cooperative efforts with power-supply companies to further develop this power-supply technology, to reduce its cost, and expand its applications. We are also interested in assisting with the design and prototyping of power supplies for demanding and unusual manufacturing applications.

Applications: The LLNL switch-mode power supply technology is useful for dc power supplies that operate with outputs of more than a few kilowatts, whenever physical size, energy efficiency, input harmonics, dynamic response, or dynamic performance during load arcing are important considerations.

Availability: This technology is available. We invite discussions of partnering opportunities.

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